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(54) LASER ADHESION OF PARTS MATERIALS

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CLAIM

1. Laser adhesion of parts materials involving the adhesion of a first thermoplastic resin material, which may be laser-permeable if a second resin material is not laser-permeable, to a second thermoplastic resin material, which may be laser-permeable if a first thermoplastic resin material is not laser-permeable, or adhesion of a first parts material, which may be laser-permeable if a parts material is not laser-permeable, to a second parts material, which may be laser-permeable if a first parts material is not laser-permeable, using an adhesive material effective when it is heated by a laser; characterized by laser radiation onto either the above-mentioned laser-permeable resin material or the above-mentioned laser-permeable parts material for adhesion of either the first resin material to the second resin material or the first parts material to the second parts material.

DETAILED EXPLANATION OF THE INVENTION

INDUSTRIAL APPLICATION FIELD

The present invention is concerned with the laser adhesion of parts materials such as resin materials.

PRIOR ART

Parts materials such as thermoplastic resin materials have been melted and adhered by ultrasonic heating, by vibration-abrasion heating, or by hot-plate heating. An adhesive was heated and activated by electromagnetic induction, and used between the parts materials to adhere them.

PROBLEMS TO BE SOLVED BY THE INVENTION

In the first conventional process involving ultrasonic heating, vibration-abrasion heating, or hot-plate heating, reaction of the molten resin was easily carried out when the molten resin was exposed to air, or it was difficult to position and adhere the resin material precisely.

In the second conventional process involving the application of electromagnetic induction for heating an adhesive, ferrite had to be mixed with the adhesive beforehand, causing a cost increase, and the shape of the material to be adhered was restricted due to the shape of the induction coil.

The present invention solves the above-mentioned problems, and provides an adhesion process involving no reaction of any molten part carried out with oxygen, but precise positioning and adhesion. In the adhesion process of the present invention, no ferrite has to be mixed with an adhesive beforehand, resulting in a low cost. In the adhesion process of the present invention, the shape of the material to be adhered does not have to be restricted due to the shape of the induction coil.

MEANS FOR SOLUTION OF THE PROBLEMS

The present invention involves the adhesion of parts materials by laser 10, involving the adhesion of first thermoplastic resin material 1, which is laser-permeable, to second thermoplastic resin material 2, or the adhesion of first parts material 5, which is laser-permeable, to second parts material 6, which may be laser-permeable, using adhesive material 7 that is effective when it is heated by laser 10; laser 10 radiation onto either the above-mentioned laser-permeable resin material 1 or the above-mentioned first laser-permeable parts material 5 for adhesion of either first resin material 1 to second resin material 2, or of first parts material 5 to second parts material 6 is performed.

FUNCTION

By the above-mentioned means, light of laser 10 is absorbed onto either the surface of resin material 2a or of adhesive 7a through either laser-permeable resin material 1 or first parts material 5, resulting in heating and melting the surfaces of both first and second resin materials 1 and 2, or resulting in heating adhesive 7, with first resin material 1 being adhered to second resin material 2, or first parts material 5 being adhered to second parts material 6.

APPLICATION EXAMPLE

In the following, the present invention is explained with the attached figures.

Figure 1 shows the adhesion process for thermoplastic resin materials.

In Figure 1, 1: first thermoplastic and laser-permeable resin material 1, 2: second thermoplastic resin material 2, which is not laser-permeable. Surface 1a of first resin material 1 is adhered to surface 2a of second resin material 2, and each of first and second resin materials 1 and 2 is supported by laser-permeable glass plate 3 or 4.

Second resin material 2 is irradiated by laser 10 such as a YAG laser through both glass plate 3 supporting first resin material 1 and through said first resin material 1. Light of laser 10 is absorbed onto surface 2a of second resin material 2 through both glass plate 3 and first resin material 1; both surfaces 1a and 2a are heated and melted, and first resin material 1 is adhered to second resin material 2.

Figure 2 shows the adhesion process involving an adhesive that is effective when it is heated.

In Figure 2, 5: first parts material 1 such as a polyethylene parts material, 6: second parts material 2 such as a polyethylene parts material. First parts material 5 is permeable to laser 10. Surface 5a is adhered to surface 6a with polyethylene 7 containing carbon black. Each of first and second parts materials 5 and 6 is supported by laser-permeable glass plate 8 or 9. When the above-mentioned polyethylene 7 is heated, it is melted and effective as an adhesive.

Polyethylene 7 containing carbon black and used as an adhesive is irradiated by laser 10 such as a YAG laser through both glass plate 3 supporting first parts material 5 and through said first parts material 5. Laser 10 light is absorbed onto surface 7a of polyethylene 7 through both glass plate 8 and first parts material 5, heating and melting polyethylene 7, with first parts material 5 being adhered to second parts material 6.

Because a parts material such as a resin is adhered and supported beforehand, followed by laser radiation for adhesion without any contact, the surfaces are positioned and adhered precisely, and no reaction of any surface with oxygen is carried out in the present invention. No ferrite has to be mixed before adhesion in the process of the present invention involving an

adhesion. The shape of the material does not have to be restricted because the position of the amplifier can be adjusted.

The present invention is not specifically restricted by the application example. In the application example, glass plates are used to support the resin materials. Transparent acryl plates may be used instead of glass plates. Also, other supporting systems may be applied.

EFFECT OF THE INVENTION

The present invention provides the laser adhesion process of parts materials involving no reaction of any melted part carried out with oxygen, but with precise positioning and adhesion, without the requirement for mixing ferrite with an adhesive, but being low cost, and with no restrictions to any shape of the material to be adhered due to the shape of the induction coil.

BRIEF EXPLANATION OF THE FIGURES

Figure 1 shows the adhesion process for thermoplastic resin materials. Figure 2 shows the adhesion process involving an adhesive that is effective when it is heated.

In Figure 1, 1: first laser-permeable resin material 1, 2: second resin material 2, which is not laser-permeable, 3, 4, 8, and 9: glass plates, 5: first laser-permeable parts material, 6: second parts material, 7: adhesive, 10: laser.

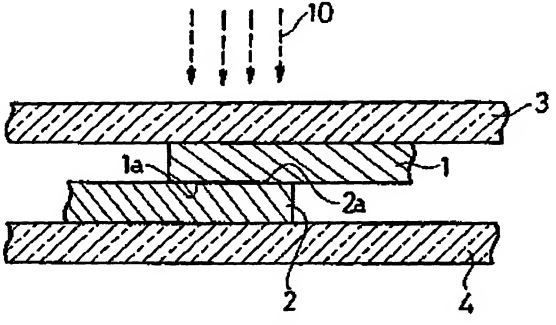

Figure 1

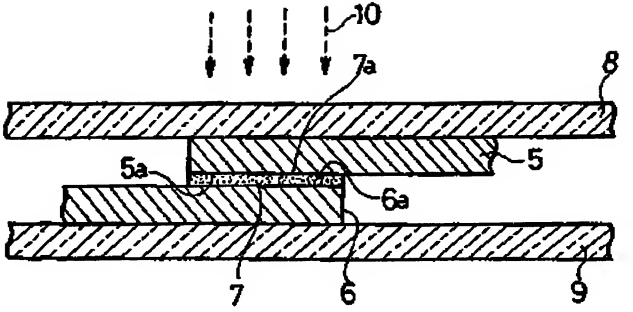

Figure 2

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